SECTION 508 FINAL RULE

(Published in Federal Register on December 21, 2000)

Electronic and Information Technology Accessibility Standards

(The text is from the Final Rule 36 CFR Part 1194 published in the Federal Register on December 21, 2000. The Section 508 Technical Standard is in bold and the explanation of the standard as provided in the preamble of the rule is in non-bold.)

Subpart B — Technical Standards

The Board has reorganized Subpart B in the final rule as follows:

The title of Subpart B has been changed from "Accessibility Standards" to "Technical Standards".

Subpart B has been reorganized so that each section addresses specific products. Each technical provision that applies to a product is located under that product heading.

1194.21   Software applications and operating systems.
1194.22   Web-based intranet and internet information and applications
1194.23   Telecommunications products
1194.24   Video and multimedia products
1194.25   Self contained, closed products
1194.26   Desktop and portable computers

The substance of each of the provisions in the final rule are discussed below.

Subpart B — Technical Standards

§ 1194.21 Software applications and operating systems.

Paragraphs (a) through (l) address provisions for software applications and operating systems.

§ 1194.21(a) When software is designed to run on a system that has a keyboard, product functions shall be executable from a keyboard where the function itself or the result of performing a function can be discerned textually.

§ 1194.21(a) requires that when software is designed to run on a system that has a keyboard, the software shall provide a way to control features which are identifiable by text, from the keyboard. For example, if a computer program included a "print" command or a "save" command (both can be readily discerned textually), the program must provide a means of invoking these commands from the keyboard. For people who cannot accurately control a mouse, having access to the software's controls through keyboard alternatives is essential. For example, rather than pointing to a particular selection on the screen, a user may move through the choices in a dialogue box by hitting the tab key. (See 1194.23(a)(4) and 1194.23(b)(1) in the Notice of Proposed Rulemaking (NPRM) March 31, 2000. (see below))

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NPRM 11924.23(a)(4) All actions available or required by the product shall be available from the keyboard or keypad. NPRM 11924.23(a)(4) provides that access to all program functions shall be available through keyboard or keypad commands. Keyboard or keypad commands provide a viable alternative for those who cannot use a pointing device or touchscreen. This provision does not require that every product have a keyboard. It requires that where a keyboard or keypad is provided, the program functions shall be available through keyboard or keypad commands.

NPRM 1194.23(b)(1)Logical navigation among interface elements shall be provided by use of keystrokes. NPRM 1194.23(b)(1) requires the use of keystrokes for navigation among interface elements. For persons with vision impairments who cannot use a pointing device such as a mouse, having access to program controls through keyboard navigation is essential. An example of this feature would be the ability to tab through the choices in a dialog box rather than requiring that a user move a pointer to a particular selection and click on it.

§ 1194.21(b) Applications shall not disrupt or disable activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer.

§ 1194.21(b)prohibits applications from disrupting or disabling activated features of other products that are identified as accessibility features, where those features are developed and documented according to industry standards. Applications also shall not disrupt or disable activated features of any operating system that are identified as accessibility features where the application programming interface for those accessibility features has been documented by the manufacturer of the operating system and is available to the product developer. The application programming interface refers to a standard way for programs to communicate with each other, including the operating system, and with input and output devices. For instance, the application programming interface affects how programs have to display information on a monitor or receive keyboard input via the operating system.

Many commercially available software applications and operating systems have features built-into the program that are labeled as access features. These features can typically be turned on or off by a user. Examples of these features may include, reversing the color scheme (to assist people with low vision), showing a visual prompt when an error tone is sounded (to assist persons who are deaf or hard of hearing), or providing "sticky keys" that allow a user to press key combinations (such as control-C) sequentially rather than simultaneously (to assist persons with dexterity disabilities). This provision prohibits software programs from disabling these features when selected. (See §1194.23(b)(2) in the NPRM. see below)

NPRM 1194.23(b)(2) Software shall not interfere with existing features of other products or operating systems that affect the usability for people with disabilities. NPRM1194.23(b)(2) prohibits applications from disabling access features of applications or the operating system. There are commercially available software applications and operating systems that have accessibility features built-in that can be turned on or off by a user. These include features that can reverse the color scheme, show an image when an error tone is generated, or provide for "sticky keys" that allow a user to hit key combinations (such as control-C) sequentially rather than simultaneously. This provision prohibits other software programs from disabling these features when selected.

§ 1194.21(c) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that assistive technology can track focus and focus changes.

§ 1194.21(c) requires that software applications place on the screen a visual indication of where some action may occur if a mouse click or keystroke takes place. This point on a screen indicating where an action will take place is commonly referred to as the "focus". This provision also requires that the focus be readable by other software programs such as screen readers used by computer users with visual impairments. (See 1194.23(b)(3) in the NPRM. (see below)).

NPRM 1194.23(b)(3) A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed so that

assistive technology can track focus and focus changes. NPRM 1194.23 Paragraph (b)(3) requires that a well-defined on-screen indication of the current focus be provided that moves among interactive interface elements as the input focus changes. The focus is the point on a screen where an action will occur when a keystroke or mouse click is activated. For example, when an individual displays a file directory on the screen, the focus point shows what file will be activated when the enter key is pressed. The focus must be programmatically exposed so that assistive technology can track the focus and focus changes and be easily seen by the user. The focus point must be identified in the program language. Making the identification of the focus point in the software programmatically available allows programmers of assistive technology software such as screen readers, to let the user know where the current focus is placed.

§ 1194.21(d) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. When an image represents a program element, the information conveyed by the image must also be available in text.

§ 1194.21(d) requires that software programs, through the use of program code, make information about the program's controls be readable by assistive technology. Simply stated, this paragraph requires that information that can be delivered to or received from the user must be made available to assistive technology, such as screen reading software. Examples of controls would include button checkboxes, menus, and toolbars. For assistive technology to operate efficiently, it must have access to the information about a program's controls to be able to inform the user of the existence, location, and status of all controls. If an image is used to represent a program function, the information conveyed by the image must also be available in text. (See 1194.23(b)(4) and 1194.23(b)(5) in the NPRM. (see below))

NPRM 1194.23(b)(4) Sufficient information about a user interface element including the identity, operation and state of the element shall be available to assistive technology. NPRM 1194.23 Paragraph (b)(4) requires that programs provide sufficient information about a user interface element, including the identity, operation and state of the element, to assistive technology software. User interface elements can include, but are not limited to, buttons, checkboxes, menu bars, or tool bars. For assistive technology to operate efficiently, it must have access to the information about a user interface from the program to be able to inform the user of the existence, location, and status of all interface elements.

NPRM 1194.23(b) (5) Where an image represents an interface element or the state of an interface element, there must be a way for assistive technology to associate meaningful text with the image. NPRM1194.23 Paragraph (b)(5) provides requirements for accessing images that represent an action. For example, a push button, checkbox or other action point is often represented by a graphic. Assistive technology however, cannot describe pictures or graphics. This provision requires that programs provide text such as a "tooltip" for the assistive technology to interpret the pictures so that a user of assistive technology can identify what action will occur when an element is activated by a keystroke or mouse click.

§ 1194.21(e) When bitmap images are used to identify controls, status indicators, or other programmatic elements, the meaning assigned to those images shall be consistent throughout an application's performance.

§ 1194.21(e) requires that when bitmap images are used by a program to identify programmatic features, such as controls, the meaning of that image shall not change during the operation of a program. "Bitmap images" refer to a type of computer image commonly used in "icons" (e.g., a small picture of a printer to activate the print command). Most screen reading programs allow users to assign text names to bitmap images. If the bitmap image changes meaning during the running of a program, the assigned identifier is no longer valid and is confusing to the user. (See 1194.23(b)(6) in the NPRM.(see below))

NPRM 1194.23(b)(6) The use of images shall be consistent throughout an application. NPRM 1194.23 Paragraph (b)(6) provides that the use of an image will be consistent throughout an application. Most screen reading programs allow users to assign text names to bitmap images. If the bitmap image should change meaning during the running of an application, the assigned identifier is no longer valid. This provision prohibits the changing of the meaning of a bitmap image during an application.

§ 1194.21(f) Textual information shall be provided through operating system functions for displaying text. The minimum information that shall be made available is text content, text input caret location, and text attributes.

§ 1194.21(f) provides that software programs use the functions provided by an operating system when displaying text. The "operating system" is the "core" computer software that controls basic functions, such as receiving information from the keyboard, displaying information on the computer screen, and storing data on the hard disk. Other software programs use the standard protocols dictated by the operating system for displaying their own information or processing the output of other computer programs. When programs are written using unique schemes for writing text on the screen or use graphics, other programs such as software for assistive technology may not be able to interpret the information. This provision in no way prohibits or limits the application programmer from developing unique display techniques. It requires that when a unique method is used, the text be simultaneously written throughout the operating system. (See 1194.23(b)(7) in the NPRM. (see below))

NPRM 1194.23(b)(7) Text shall be provided through an application programming interface supporting interaction with assistive technology or use system text writing tools. The minimum information that shall be available to assistive technology is text content, text input caret location, and text attributes. NPRM 1194.23 (b)(7) provides that software must follow standard programming techniques applicable for the specific operating system when software programs supply text to assistive technology programs. If programs are written using nonstandard code, other programs such as software for assistive technology may not be able to receive information from the application. At a minimum, the types of text information that must be available include text content, text input caret location, and text attributes.

§ 1194.21(g) Applications shall not override user selected contrast and color selections and other individual display attributes

§ 1194.21(g) prohibits applications from overriding user selected contrast and color selections and other individual display attributes. As described above, the operating system provides the basic functions for receiving, displaying, transmitting, or receiving information in a computer. Thus, the operating system would appear the logical choice for "system-wide" settings that would be respected by all computer programs on a computer. Many modern operating systems incorporate the ability to make system-wide settings as an accessibility feature. This permits, for instance, users to display all text in very large characters. Often persons with disabilities prefer to select color, contrast, keyboard repeat rate, and keyboard sensitivity settings provided by an operating system. When an application disables these system-wide settings, accessibility is reduced. This provision allows the user to select personalized settings which cannot be disabled by software programs. (See 1194.23(b)(9) in the NPRM.(see below))

NPRM 1194.23(b)(9) An option shall be provided to ignore individual application display attributes so system-wide settings will be maintained. NPRM 1194.23 (b)(9) prohibits applications from overriding user selected contrast and color selections. This provision addresses the problem of applications refusing to respect system-wide settings and is consistent with the recommendations of the advisory committee. Often persons with disabilities prefer to select color, contrast, keyboard repeat rate, and keyboard sensitivity settings in an operating system. When an application disables these settings, accessibility is reduced.

§ 1194.21(h) When animation is displayed, the information shall be displayable in at least one non-animated presentation mode at the option of the user.

§ 1194.21(h) addresses animated text or objects. The use of animation on a screen can pose serious access problems for users of screen readers or other assistive technology applications. When important elements such as push-buttons or relevant text are animated, the user of assistive technology cannot access the application. This provision requires that in addition to the animation, an application provide the elements in a non-animated form. (See 1194.23(b)(11)in the NPRM. (see below))

NPRM 1194.23(b)(11) If animated or moving text is provided it shall also be displayable in at least one static presentation mode at the option of the user. NPRM 1194.23(b)(11) establishes requirements for handling animated text. The use of animation on a screen can pose serious access problems for users of screen readers or other assistive technology. When important elements such as push buttons or relevant text are animated, the user of assistive technology cannot access the application. This provision requires that in addition to the animation, an application provide the elements in a static form.

§ 1194.21(i) Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

§ 1194.21(i) prohibits the use of color as the single method for indicating important information. For instance, a computer program that requires a user to distinguish between otherwise identical red and blue squares for different functions (e.g., printing a document

versus saving a file) violates this provision. Relying on color as the only method for identifying screen elements or controls poses serious problems, not only for people with limited or no vision, but also for those who are color blind. This provision does not prohibit the use of color to enhance identification of important features. It does, however, require that some other method of identification, such as text labels, be combined with the use of color. (See 1194.21(a) in the NPRM.)

§ 1194.21(j) When a product permits a user to adjust color and contrast settings, a variety of color selections capable of producing a range of contrast levels shall be provided.

§ 1194.21(j) requires software applications to provide users with a variety of color settings that can be used to set a range of contrast levels. (See 1194.23(b)(8) in the NPRM.(see below))

NPRM 1194.23(b)(8) A minimum of 8 foreground and 8 background color selections capable of producing a variety of contrast levels shall be provided. NPRM 1194.23 (b)(8) requires that a minimum of eight foreground and eight background color selections capable of producing a variety of contrast levels be provided. This provision requires more than just providing color choices. The available choices must also allow for different levels of contrast. Many people experience a high degree of sensitivity to bright displays. Someone with this condition cannot focus on a bright screen for long because they will soon be unable to distinguish individual letters. An overly bright background causes a visual 'white-out'. To alleviate this problem, the user must be able to select a softer background and appropriate foreground colors.

In addition to requiring different levels of colors and contrasts, the advisory committee recommended providing a "wide variety" of font size and style settings. The proposed provision does not require variations of font sizes and styles because those who would benefit from increased font size will also need an increase in the size of all screen elements. This can best be accomplished by adding screen enlargement software to the system.

§ 1194.21(k) Software shall avoid the use of flashing or blinking text, objects, or other elements having a flash or blink frequency greater than 2 Hz and lower than 55 Hz.

§ 1194.21(k) limits the flashing or blinking rate of screen items. (See 1194.21(c) in the NPRM. see below)

NPRM 1194.21(c) When flashing or blinking text, objects or other elements are displayed, the flash rate shall not exceed two Hertz. NPRM 1194.21(c) provides that flashing visual displays and indicators shall not exceed a frequency of two Hertz. In 1988, the Board sponsored two research projects on visual fire alarms that found that individuals with photosensitive epilepsy can have a seizure triggered by displays which flicker or flash, particularly if the flash has a high intensity and is within certain frequency ranges. This provision limits the frequency of flashing visual displays and indicators to avoid triggering a seizure in an individual with photosensitive epilepsy. This requirement is consistent with the Telecommunications Act Accessibility Guidelines and the recommendations of the advisory committee.

§ 1194.21(l) When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements, and functionality required for completion and submission of the form including all directions and cues.

§ 1194.21(l) requires that people with disabilities have access to electronic forms. This section (*i.e. 1194.21(l) added for clarity*)... is identical to section 1194.22(n) (*Section 1194.22(n) is in Web-based intranet and internet information and applications*). (See 1194.23(b)(10) in the NPRM.(see below))

(NPRM 1194.23(b)(10) requires that people with disabilities have access to electronic forms. Electronic forms are a popular method used by many agencies to gather information or permit a person to apply for services, benefits, or employment. The 1998 Government Paperwork Elimination Act requires that Federal agencies make electronic versions of their forms available online and allows individuals and business to use electronic signatures to file these forms electronically. This provision requires that when an agency uses a form that cannot be read and
manipulated by assistive technology, an alternative form must also be provided that is accessible. An example of a form which is not accessible is one which is graphical in nature and cannot be translated into meaningful text by assistive technology.)

Subpart B — Technical Standards

§ 1194.22 Web-based intranet and internet information and applications.

In the proposed rule, the Board indicated that the EITAAC had recommended that the Board's rule directly reference priority one and two checkpoints of the World Wide Web Consortiums' (W3C) Web Accessibility Initiative's (WAI) Web Content Accessibility Guidelines 1.0 (WCAG 1.0). Rather than reference the WCAG 1.0, the proposed rule and this final rule include provisions which are based generally on priority level one checkpoints of the Web Content Accessibility Guidelines 1.0, as well as other agency documents on web accessibility and additional recommendations of the EITAAC. The Board's rephrasing of language from the WCAG 1.0, as well as other agency documents on web accessibility and additional recommendations of the EITAAC.

§ 1194.22(a) A text equivalent for every non-text element shall be provided (e.g., via "alt", "longdesc", or in element content).

§ 1194.22(a) requires that a text equivalent for every non-text element shall be provided. As the
Internet has developed, the use of photographs, images, and other multimedia has increased greatly. Most web pages are created using HTML, or "HyperText Markup Language." A "page" in HTML is actually a computer file that includes the actual text of the web page and a series of "tags" that control layout, display images (which are actually separate computer files), and essentially provide all content other than text. The tags are merely signals to the browser that tell it how to display information and many tags allow

web designers to include a textual description of the non-textual content arranged by the tag. The provision is necessary because assistive technology cannot describe pictures, but can convey the text information to the user. Currently, most web page authoring programs already provide a method for web designers to associate words with an image and associating text with non-textual content is easy for anyone familiar with HTML. This provision requires that when an image indicates a navigational action such as "move to the next screen" or "go back to the top of the page," the image must be accompanied by actual text that states the purpose of the image, in other words, what the image is telling you to do. This provision also requires that when an image is used to represent page content, the image must have a text description accompanying it that explains the meaning of the image. Associating text with these images makes it possible, for someone who cannot see the screen to understand the content and navigate a web page. (See §1194.23(c)(1) in the NPRM. see below)

NPRM 1194.23(c)(1) A text equivalent for every non-text element shall be provided via "alt" (alternative text attribute), "longdesc" (long description tag), or in element content.

§ 1194.22(b) Equivalent alternatives for any multimedia presentation shall be synchronized with the presentation.

§ 1194.22(b) provides that equivalent alternatives for any multimedia presentation shall be synchronized with the presentation. This would require, for example, that if an audio portion of a multi-media production was captioned as required in paragraph (a), the captioning must be synchronized with the audio. (See §1194.23(c)(12) and (e)(3) in the NPRM.)

§ 1194.22(c) Web pages shall be designed so that all information conveyed with color is also available without color, for example from context or markup.

§ 1194.22(c) prohibits the use of color as the single method for indicating important information on a web page. When colors are used as the sole method for identifying screen elements or controls, persons who are color blind as well as those people who are blind or have low vision may find the web page unusable. This provision does not prohibit the use of color to enhance identification of important features. It does however, require that some other method of identification, such as text labels, must be combined with the use of color. (See 1194.23(c)(2) in the NPRM.)

§ 1194.22(d) Documents shall be organized so they are readable without requiring an associated style sheet.

§ 1194.22(d) provides that documents must be organized so they are readable without requiring browser support for style sheets. Style sheets are a relatively new technology

that lets web site designers make consistent appearing web pages that can be easily updated. For instance, without style sheets, making headings appear in large font while not affecting the surrounding text requires separate tags hidden in the document to control font-size and boldface. Each heading would require a separate set of tags. Using style sheets, however, the web site designer can specify in a single tag that all headings in the document should be in large font and boldface. Because style sheets can be used to easily affect the entire appearance of a page, they are often used to enhance accessibility and this provision does not prohibit the use of style sheets. This provision requires that web pages using style sheets be able to be read accurately by browsers that do not support style sheets and by browsers that have disabled the support for style sheets. (See 1194.23(c)(4) in the NPRM.) This requirement is based on the fact that style sheets are a relatively new technology and many users with disabilities may either not have computer software that can properly render style sheets or because they may have set their own style sheet for all web pages that they view.

§ 1194.22(e) Redundant text links shall be provided for each active region of a server-side image map.

§ 1194.22(e) requires web page designers to include redundant text links for each active region of a server-side image map on their web pages. An "image map" is a picture (often a map) on a web page that provides different "links" to other web pages, depending on where a user clicks on the image. There are two basic types of image maps: "client-side image maps" and "server-side image maps." With client-side image maps, each "active region" in a picture can be assigned its own "link" (called a URL or "uniform resource locator") that specifies what web page to retrieve when a portion of the picture is selected. HTML allows each active region to have its own alternative text, just like a picture can have alternative text. See 1194.22(a). By contrast, clicking on a location of a server-side image map only specifies the coordinates within the image when the mouse was depressed – which link or URL is ultimately selected must be deciphered by the computer serving the web page. When a web page uses a server-side image map to present the user with a selection of options, browsers cannot indicate to the user the URL that will be followed when a region of the map is activated. Therefore, the redundant text link is necessary to provide access to the page for anyone not able to see or accurately click on the map. (See 1194.23(c)(6) in the NPRM.) No substantive changes have been made to this provision in the final rule.

§ 1194.22(f) Client-side image maps shall be provided instead of server-side image maps except where the regions cannot be defined with an available geometric shape.

§ 1194.22(f) provides that client-side image maps must be used whenever possible in place of server-side image maps. As discussed above, there are two general categories of image maps: client-side image maps and server-side image maps. When a web browser retrieves a specific set of instructions from a web page called a client-side image

map, it also receives all the information about what action will happen when a region of the map is pressed. For this reason, client-side image maps, even though graphical in nature, can display the links related to the map, in a text format which can be read with the use of assistive technology. (See 1194.23(c)(7) in the NPRM.)

§ 1194.22(g) Row and column headers shall be identified for data tables.

§ 1194.22(g) permit the use of tables, but require that the tables be coded according to the rules for developing tables of the language used. When tables are coded inaccurately or table codes are used for non-tabular material, assistive technology cannot accurately read the content. Many assistive technology applications can interpret the HTML codes for tables and will most likely be updated to read the table coding of new markup languages. (See 1194.23(c)(8-9) in the NPRM.)
The Board will be developing technical assistance materials on how tables can comply with this section. In addition to these specific provisions, the technical assistance materials will address all of the provisions in this part.

§ 1194.22(h) Markup shall be used to associate data cells and header cells for data tables that have two or more logical levels of row or column headers.

§ 1194.22(h) permit the use of tables, but require that the tables be coded according to the rules for developing tables of the language used. When tables are coded inaccurately or table codes are used for non-tabular material, assistive technology cannot accurately read the content. Many assistive technology applications can interpret the HTML codes for tables and will most likely be updated to read the table coding of new markup languages. (See 1194.23(c)(8-9) in the NPRM.) The Board will be developing technical assistance materials on how tables can comply with this section. In addition to these specific provisions, the technical assistance materials will address all of the provisions in this part.

§ 1194.22(i) Frames shall be titled with text that facilitates frame identification and navigation.

§ 1194.22(i) addresses the use of frames and requires that they be titled with text to identify the frame and assist in navigating the frames. "Frames" are a technique used by web designers to create different "portions" or "frames" of their screen that serve different functions. When a web site uses frames, often only a single frame will update with information while the other frames remain intact. Because using frames gives the user a consistent portion of the screen, they are often used for navigational toolbars for web sites. They are also often faster because only a portion of the screen is updated, instead of the entire screen. Frames can be an asset to users of screen readers and other assistive technology if the labels on the frames are explicit. Labels such as top, bottom, or left, provide few clues as to what is contained in the frame. However, labels such as

"navigation bar" or "main content" are more meaningful and facilitate frame identification and navigation. (See 1194.23(c)(10) in the NPRM.) This provision uses language that is not substantively different than the WCAG 1.0.

§ 1194.22(j) Pages shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.

§ 1194.22(j) sets limits on the blink rate of screen elements. This section is a result of the reorganization of the final rule and is similar to 1194.21(k) discussed above. (See 1194.21(c) in the NPRM.) This provision is meant to be consistent with WCAG 1.0 Checkpoint 7.1 which provides that, "Until user agents allow users to control flickering, avoid causing the screen to flicker." This provision use language which is more consistent with enforceable regulatory language.

§ 1194.22(k) A text-only web page, with equivalent information or functionality, shall be provided to make a web site comply with the provisions of this part, when compliance cannot be accomplished in any other way. The content of the text-only page shall be updated whenever the primary page changes.

§ 1194.22(k) requires that a text-only web page shall only be provided as a last resort method for
bringing a web site into compliance with the other requirements in §1194.22. Text-only pages must contain equivalent information or functionality as the primary pages. Also, the text-only page shall be updated whenever the primary page changes. This provision is meant to be consistent with WCAG 1.0 Checkpoint 11.4 which provides that "[i]f, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page."

§ 1194.22(l) When pages utilize scripting languages to display content, or to create interface elements, the information provided by the script shall be identified with functional text that can be read by assistive technology.

§ 1194.22(l) requires that when web pages rely on special programming instructions called "scripts"to affect information displayed or to process user input, functional text shall be provided. It also requires that the text be readable by assistive technology such as screen reading software. Scripts are widely used by web sites as an efficient method to create faster or more secure web
communications. A script is a programmatic set of instructions that is downloaded with a web page and permits the user's computer to share the processing of information with the

web server. Without scripts, a user performs some action while viewing a web page, such as selecting a link or submitting a form, a message is sent back to the "web server", and a new web page is sent back to the user's computer. The more frequently an individual computer has to send and receive information from a web server, the greater chance there is for errors in the data, loss of speed, and possible violations of security. Also, when many users are simultaneously viewing the same web page, the demands on the web server may be huge. Scripts allow more work to be performed on the individual's computer instead of on the web server. And, the individual computer does not have to contact the web server as often. Scripts can perform very complex tasks such as those necessary to complete, verify, and submit a form and verify credit information. The advantage for the user is that many actions take place almost instantly, because processing takes place on the user's computer and because communication with the web server is often not necessary. This improves the apparent speed of a web page and makes it appear more dynamic. Currently, JavaScript, a standardized object-oriented programming language, is the most popular scripting language, although certain plug-ins (see below) support slightly different scripting languages. This provision requires web page authors to ensure that all the information placed on a screen by a script shall be available in a text form to assistive technology. (See §1194.23(c)(11) in the NPRM.)

§ 1194.22(m) When a web page requires that an applet, plug-in or other application be present on the client system to interpret page content, the page must provide a link to a plug-in or applet that complies with 1194.21(a) through (l).

§ 1194.22(m) is, in part, a new provision developed in response to comments received on 1194.23(c)(11) of the NPRM and discussed in the preceding paragraph. While most web browsers can easily read HTML and display it to the user, several private companies have developed proprietary file formats for transmitting and displaying special content, such as multimedia or very precisely defined documents. Because these file formats are proprietary, they cannot ordinarily be displayed by web browsers. To make it possible for these files to be viewed by web browsers, add-on programs or "plug-ins" can be downloaded and installed on the user's computer that will make it possible for their web browsers to display or play the content of the files. This provision requires that web pages which provide content such as Real Audio or PDF files, also provide a link to a plug-in that will meet the software provisions. It is very common for a web page to provide links to needed plug-ins. For example, web pages containing Real Audio almost always have a link to a source for the necessary player. This provision places a responsibility on the web page author to know that a compliant application exists, before requiring a plug-in. (See 1194.21(c)(11) in the NPRM.)

§ 1194.22(n) When electronic forms are designed to be completed online, the form shall allow people using assistive technology to access the information,

field elements, and functionality required for completion and submission of the form including all directions and cues.

§ 1194.22(n) requires that people with disabilities have access to interactive electronic forms. Electronic forms are a popular method used by many agencies to gather information or permit a person to apply for services, benefits, or employment. The 1998 Government Paperwork Elimination Act requires that Federal agencies make electronic versions of their forms available online when practicable and allows individuals and businesses to use electronic signatures to file these forms electronically. (See 1194.23(b)(10) in the NPRM.) At present, the interaction between form controls and screen readers can be unpredictable, depending upon the design of the page containing these controls. Some developers place control labels and controls in different table cells; others place control labels in various locations in various distances from the controls themselves, making the response from a screen reader less than accurate many times.

§ 1194.22(o) A method shall be provided that permits users to skip repetitive navigation links.

§ 1194.22(o) provides that a method be used to facilitate the easy tracking of page content that provides users of assistive technology the option to skip repetitive navigation links. (See 1194.21(b)(13) in the NPRM.) No substantive comments were received on this provision and no changes were made, other than editorial changes.

§ 1194.22(p) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

§ 1194.22 (p) addresses the accessibility problems that can occur if a web page times out while a user is completing a form. Web pages can be designed with scripts so that the web page disappears or "expires" if a response is not received within a specified amount of time. Sometimes, this technique is used for security reasons or to reduce the demands on the computer serving the web pages. A disability can have a direct impact on the speed with which a person can read, move around or fill in a web form. For this reason, when a timed response is required, the user shall be alerted and given sufficient time to indicate that additional time is necessary. (See 1194.21(d) in the NPRM.)

Note to §1194.22: 1. The Board interprets paragraphs (a) through (k) of this section (*1194.22 Web-based intranet and internet information and applications added by Natalie for clarification*)**as consistent with the following priority 1 Checkpoints of the Web Content Accessibility Guidelines 1.0 (WCAG 1.0) (May 5, 1999) published by the Web Accessibility Initiative of the World Wide Web Consortium:**

Section 1194.22 Paragraph	WCAG 1.0 Checkpoint
(a)	1.1
(b)	1.4
(c)	2.1
(d)	6.1
(e)	1.2
(f)	9.1
(g)	5.1
(h)	5.2
(i)	12.1
(j)	7.1
(k)	11.4

2. Paragraphs (l), (m), (n), (o), and (p) of this section are different from WCAG 1.0. Web pages that conform to WCAG 1.0, level A (i.e., all priority 1 checkpoints) must also meet paragraphs (l), (m), (n), (o), and (p) of this section to comply with this section. WCAG 1.0 is available at http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505.

Subpart B — Technical Standards

§ 1194.23 Telecommunications products.

§ 1194.23(a) Telecommunications products or systems which provide a function allowing voice communication and which do not themselves provide a TTY functionality shall provide a standard non-acoustic connection point for TTYs. Microphones shall be capable of being turned on and off to allow the user to intermix speech with TTY use.

§ 1194.23(a) requires that telephone equipment shall provide a standard non-acoustic connection point for TTYs. A TTY is a device that includes a keyboard and display that is used to transmit and receive text over a telephone line using sound. Originally, TTY's used acoustic connections and the user placed the telephone handset on the TTY to transfer the sound signals between the TTY and the telephone. Unfortunately, an acoustic connection is unreliable, inconvenient, and cannot be used in noisy environments. Individuals who use TTYs to communicate must have a non_acoustic way to connect TTYs to telephones in order to obtain clear TTY connections, such as through a direct RJ-11 connector, a 2.5 mm audio jack, or other direct connection. When a TTY is connected directly into the network, it must be possible for the acoustic pickup (microphone) to be turned off (automatically or manually) to avoid having background noise in a noisy environment mixed with the TTY signal. Since some TTY users make use of speech for outgoing communications, the microphone on/off switch must be easy to flip back and forth or a push-to-talk mode should be available. In the Telecommunications Act Accessibility Guidelines (36 CFR Part 1193), the Board recognized that direct-connect TTYs are customer premises equipment (CPE) subject to section 255 of that Act. Since CPE is a subset of electronic and information technology, it is similarly covered by this rule. This provision was adopted from the Board's Telecommunications Act Accessibility Guidelines so that manufacturers of telecommunications and customer premises equipment covered by section 255 of the Telecommunications Act wishing to sell products to the Federal government would have a consistent set of requirements. (See 1194.23(d)(1) in the NPRM. see below)

NPRM 1194.23(d)(*1) Telecommunications products which provide a function allowing voice communication and which do not themselves provide a TTY functionality shall provide a standard non-acoustic connection point for TTYs. It shall also be possible for the user to easily turn any microphone on and off to allow the user to intermix speech with TTY use.*

NPRM 1194.23(d)(1) requires that products shall provide a standard non-acoustic connection point for TTYs when they have a function that allows voice communication and do not provide a TTY functionality. It shall also be possible for the user to easily turn any microphone on the product on and off to enable the user who can talk to intermix speech with TTY use. Individuals who use TTYs to communicate must have a non-acoustic way to connect TTYs to telephones in order to obtain clear TTY connections, such as through a direct RJ-11 connector, a 2.5 mm audio jack, or automatic switching. When a TTY is connected directly into the network, it must be possible to turn off the acoustic pickup (microphone) to avoid having background noise in a noisy environment mixed with

the TTY signal. Since some TTY users make use of speech for outgoing communications, the microphone on/off switch must be easy to flip back and forth or a push-to-talk mode should be available.

These standards apply to the electronic and information technology products themselves, not the furniture they occupy. Therefore, it is not appropriate to address auxiliary features such as shelves and electrical outlets in these standards.

§ 1194.23(b) Telecommunications products which include voice communication functionality shall support all commonly used cross-manufacturer non-proprietary standard TTY signal protocols.

§ 1194.23(b) requires that products providing voice communication functionality be able to support use of all commonly used cross_manufacturer, non_proprietary, standard signals used by TTYs. Some products compress or alter the audio signal in such a manner that standard signals used by TTYs are not transmitted properly, preventing successful TTY communication. This provision is consistent with the Telecommunications Act Accessibility Guidelines. (See 1194.23(d)(2) in the NPRM. (see below))

 NPRM 1194.23(d)(2) Telecommunications products which include voice communication functionality shall *support use of all cross-manufacturer non-proprietary standard signals used by TTYs.* NPRM1194.23(d)(2) requires products providing voice communication functionality to be able to support use of all cross-manufacturer non-proprietary standard signals used by TTYs. Some products compress the audio signal in such a manner that standard signals used by TTYs are distorted or attenuated, preventing successful TTY communication. Use of such technology is not prohibited as long as the compression can be turned off to allow undistorted TTY communication.

§ 1194.23(c) Voice mail, auto-attendant, and interactive voice response telecommunications systems shall be usable by TTY users with their TTYs.

§ 1194.23(c) provides that TTY users be able to utilize voice mail, auto-attendant, and interactive voice response telecommunications systems. Voice mail systems are available which allow TTY users to retrieve and leave TTY messages. This provision does not require that phone systems have voice to text conversion capabilities. It requires that TTY users can retrieve and leave TTY messages and utilize interactive systems. (See 1194.23(d)(3) in the NPRM.(see below))

NPRM 1194.23(d)(*3) Voice mail, auto-attendant, and interactive voice response telecommunications systems* *shall be usable by TTY users with their TTYs.* NPRM 1194.23(d)(3) provides that voice mail, auto-attendant, and interactive voice response telecommunications systems shall be usable by TTY users with their TTYs. Voice mail systems are available which allow TTY users to retrieve and leave TTY messages. This provision does not require that phone systems have voice to text conversion capabilities so that a person who is deaf can retrieve a voice mail message directly with their TTY without relying on a relay service or an interpreter, but it does require that TTY users can retrieve and leave TTY messages.

This provision requires that voice mail, auto-attendant, and interactive voice response systems be usable with TTYs. It is desirable that computers have built-in TTY capability and there are currently systems which can add such functionality to computers. This provision is a performance requirement and the Board does not feel it would be useful to be more specific at this time. The current problems with voice mail and voice response

systems are not necessarily susceptible to a single solution and there are several ways to comply, including voice recognition in some cases, depending on the system. Many voice mail systems could record a TTY message, just like a voice message, but a TTY user may not know when to start or stop keying. A requirement for a quick response to menu choices is the most frequently reported barrier for relay users. The ability to "opt out" of a menu and connect with an operator or transfer to a TTY system are also means to make these services available and usable without highly sophisticated decoding technology. Federal agencies procuring TTYs should ensure that they provide the appropriate functionality.

§ 1194.23(d) Voice mail, messaging, auto-attendant, and interactive voice response telecommunications systems that require a response from a user within a time interval, shall give an alert when the time interval is about to run out, and shall provide sufficient time for the user to indicate more time is required.

§ 1194.23(d) addresses access problems that can arise when telecommunications systems require a response from a user within a certain time. Due to the nature of the equipment, users of TTYs may need additional time to read and respond to menus and messages. This provision is identical to section 1194.22(p) discussed above. (See 1194.21(d)(4) in the NPRM.)

 The final rule requires only that a user be notified if a process is about to timeout and be given an opportunity to answer a prompt asking whether additional time is needed. If required, additional time would be provided.

§ 1194.23(e) Where provided, caller identification and similar telecommunications functions shall also be available for users of TTYs, and for users who cannot see displays.

§ 1194.23(e) requires that functions such as caller identification must be accessible for users of TTYs, and for users who cannot see displays. (See 1194.23(d)(5) in the NPRM.(see below))

NPRM 1194.23(d)(5) Where provided, caller identification and similar telecommunications functions shall also be available for users of TTYs, telecommunications relay services, and for users who cannot see displays. NPRM 1994.23(d)(5) provides that functions such as caller identification must be accessible for users of TTYs, telecommunications relay services, and for users who cannot see displays. Response. Since the end users in a telecommunications relay service (TRS) are not directly connected, there is no way that caller ID information could be directly communicated, therefore, the reference to relay services has been deleted to avoid confusion.

§ 1194.23(f) For transmitted voice signals, telecommunications products shall provide a gain adjustable up to a minimum of 20 dB. For incremental volume control, at least one intermediate step of 12 dB of gain shall be provided.

§ 1194.23(f) requires products to be equipped with volume control that provides an adjustable amplification up to a minimum of 20 dB of gain. If a volume adjustment is provided that allows a user to set the level anywhere from 0 to the upper requirement of 20 dB, there is no need to specify a lower limit. If a stepped volume control is provided, one of the intermediate levels must provide 12 dB of gain. The gain applies to the voice output. (See 1194.23(d)(6) in the NPRM (see below).)

NPRM 1194.23(d)(6) For transmitted voice signals, telecommunications products shall provide a gain adjustable up to a minimum of 20 dB. For incremental volume control, at least one intermediate step of 12 dB of gain shall be provided.
NPRM 1194.23(d)(6) requires products to be equipped with volume control that provides an adjustable amplification up to a minimum of 20 dB of gain. If a volume adjustment is provided that allows a user to set the level anywhere from 0 to the upper requirement of 20 dB, there is no need to specify a lower limit. If a stepped volume control is provided, one of the intermediate levels must provide 12 dB of gain. The gain applies to the voice output not Baudot, ASCII, or other machine codes. The proposed level of amplification is different from that required under the Hearing Aid Compatibility Act and the Federal Communications Commission's (FCC) regulations (47 CFR 68.317 (a)). The FCC requires volume control that provides, through the receiver in the handset or headset of the telephone, 12 dB of gain minimum and up to 18 dB of gain maximum, when measured in terms of Receive Objective Loudness Rating.

§ 1194.23(g) If the telecommunications product allows a user to adjust the receive volume, a function shall be provided to automatically reset the volume to the default level after every use.

§ 1194.23(g) requires that an automatic reset be installed on any telephone that allows the user to adjust the volume higher then the normal level. This is a safety feature to protect people from suffering damage to their hearing if they accidentally answer a telephone with the volume turned too high. (See 1194.23(d)(7) in the NPRM (see below).)

NPRM 1194.23(d)(7) If the telecommunications product allows a user to adjust the receive volume, a function shall be provided to automatically reset the volume to the default level after every use but not before.
NPRM 1194.23(d)(7) requires that an automatic reset be installed on any telephone that allows the user to adjust the volume higher then the normal level. This is a safety feature to protect people from suffering damage to their hearing if they accidentally answer a telephone with the volume turned too high.

§ 1194.23(h) Where a telecommunications product delivers output by an audio transducer which is normally held up to the ear, a means for effective magnetic wireless coupling to hearing technologies shall be provided.

§ 1194.23(h) requires telephones, or other products that provide auditory output by an audio transducer normally held up to the ear, to provide a means for effective wireless coupling to hearing aids. Many hearing aids incorporate "T-coils" that generate sounds based on magnetic signals received from earpieces that can generate the appropriate magnetic field. Generally, this provision means the earpiece generates sufficient magnetic field strength to induce an appropriate field in a hearing aid T-coil. The output in this case is the direct voice output of the transmission source, not the "machine language" such as

tonal codes transmitted by TTYs. For example, a telephone must generate a magnetic output so that the hearing aid equipped with a T-coil can accurately receive the message. This provision is consistent with the Telecommunications Act Accessibility Guidelines. (See 1194.23(d)(8) in the NPRM (see below).) No substantive comments were received and **no changes have been made to this section in the final rule.**

NPRM 1194.23(d)(8) Where a telecommunications product delivers output by an audio transducer, which is normally held up to the ear, a means for effective magnetic wireless coupling to hearing technologies shall be provided.
NPRM 1194.23(d)(8) requires products that provide auditory output by an audio transducer normally held up to the ear, to provide a means for effective wireless coupling to hearing aids. Generally, this means the earpiece generates sufficient magnetic field strength to induce an appropriate field in a hearing aid T-coil. The output in this case is the direct voice output of the transmission source, not the "machine language" such as tonal codes transmitted by TTYs. For example, a telephone must generate a magnetic output so that the hearing aid equipped with a T-coil can accurately receive the message.

§ 1194.23(i) Interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) shall be reduced to the lowest possible level that allows a user of hearing technologies to utilize the telecommunications product.

§ 1194.23(i) requires that interference to hearing technologies be reduced to the lowest possible level that allows a user of hearing technologies to utilize a telecommunications product. Individuals who are hard of hearing use hearing aids and other assistive listening devices, but they cannot be used if products introduce noise into the listening aids because of electromagnetic interference. (See 1194.23(d)(9) in the NPRM.)

NPRM 1194.23(d)(9) Interference to hearing technologies (including hearing aids, cochlear implants, and assistive listening devices) shall be reduced to the lowest possible level that allows a user of hearing technologies to utilize the telecommunications product. NPRM 1194.23(d)(9) requires that interference to hearing technologies shall be reduced to the lowest possible level that allows a user of hearing technologies to utilize a telecommunications product. Individuals who are hard of hearing use hearing aids and other assistive listening devices, but they cannot be used if products introduce noise into the listening aids because of electromagnetic interference. The American National Standards Institutes (ANSI) has established a task group under its subcommittee on medical devices to work toward the development of methods of measurement and defining the limits for hearing aid compatibility and accessibility to wireless telecommunications. The ANSI C63.19 task group is continuing to develop its standard, C63.19-199X, American National Standard for Methods of Measurement for Hearing Aid Compatibility with Wireless Communications Devices. When the standard is completed, the Board may reference it.

Compliance with the ANSI C63.19 ANSI/IEEE Standard for Hearing Aid Compatibility with Wireless Devices would meet this provision.

§ 1194.23(j) Products that transmit or conduct information or communication, shall pass through cross-manufacturer, non-proprietary, industry-standard codes, translation protocols, formats or other information necessary to provide the information or communication in a usable format. Technologies which use encoding, signal compression, format transformation, or

similar techniques shall not remove information needed for access or shall restore it upon delivery.

§ 1194.23 (j) provides that all products that act as a transport or conduit for information or communication shall pass all codes, translation protocols, formats, or any other information necessary to provide information or communication in a usable format. In particular, signal compression technologies shall not remove information needed for access or shall restore it upon decompression. Some transmissions include codes or tags embedded in "unused" portions of the signal to provide accessibility. For example, closed captioning information is usually included in portions of a video signal not seen by users without decoders. This section prohibits products from stripping out such information or requires the information to be restored at the end point. (See 1194.25(a) in the NPRM.) No substantive comments were received and no changes have been made to this section in the final rule.

§ 1194.23(k) Products which have mechanically operated controls or keys, shall comply with the following:

§ 1194.23(k) addresses controls that require some physical force to activate. It is the application of force to these controls that distinguishes them from touch sensitive controls where the mere presence of a hand or finger is detected and reacted to by the product. (See 1194.23(a) in the NPRM. (see below))

NPRM 1194.23(a) Mechanically operated controls, keyboards or keypads.

§ 1194.23*(k)(1) Controls and keys shall be tactilely discernible without activating the controls or keys.*

§ 1194.23(k)(1) provides that mechanically operated controls and keys shall be tactilely discernible without activating the controls or keys. Tactilely discernible means that individual keys can be located and distinguished from adjacent keys by touch. To comply with this provision, controls that must be touched to activate, must be distinguishable from each other. This can be accomplished by using various shapes, spacing, or tactile markings. Because touch is necessary to discern tactile features, this provision provides that the control should not be activated by mere contact. For example, the standard desktop computer keyboard would meet this provision because the tactile mark on the "j" and "f" keys permits a user to locate all other keys tactilely. The geographic spacing of the function, 'numpad' and cursor keys make them easy to locate by touch. In addition, most keyboards require some pressure before they transmit a keystroke. Conversely, "capacitance" keyboards that react as soon as they are touched and have no raised marks or actual keys would not meet this provision. A "membrane" keypad with keys that must be pressed can be made tactilely discernible by separating keys with raised ridges so that individual keys can be distinguished by touch. (See 1194.23(a)(1) in the NPRM. (see

below)) No substantive comments were received and no changes have been made to this section in the final rule.

NPRM 1194.23(a)(1) Controls and keys shall be tactilely discernible without activating the controls or keys. NPRM1194.23 (a)(1) provides that controls and keys shall be tactilely discernible without activating the controls or keys. Tactilely discernible means that individual keys can be located and distinguished from adjacent keys. To comply with this requirement, controls that must be touched to activate, must be distinguishable from each other. This can be accomplished by using various shapes, spacing, or tactile markings. Because touch is necessary to discern tactile features, this provision provides that the control should not be activated by mere touching. For example, the standard desktop computer keyboard would meet this requirement because the tactile mark on the "j" and "f" keys permits a user to locate all other keys tactilely. The geographic spacing of the function, 'numpad' and cursor keys make them easy to locate by touch. In addition, most keyboards require some pressure before they transmit a keystroke. Conversely, "capacitance" keyboards that react as soon as they are touched and have no raised marks or actual keys would not meet this requirement. A "membrane" keypad with keys that must be pressed can be made tactilely discernible by separating keys with raised ridges so that individual keys can be distinguished by touch.

§ 1194.23*(k)(2) Controls and keys shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls and keys shall be 5 lbs. (22.2 N) maximum.*

§ 1194.23(k)(2) provides that mechanically operated controls shall be accessible to persons with limited dexterity. Individuals with tremor, cerebral palsy, paralysis, arthritis, or artificial hands may have difficulty operating systems which require fine motor control, assume a steady hand, or require two hands or fingers to be used simultaneously for operation. Individuals with high spinal cord injuries, arthritis, and other conditions may have difficulty operating controls which require significant strength. The provision limits the force required to five pounds and is based on section 4.27.4 of the ADA Accessibility Guidelines and is consistent with the Telecommunications Act Accessibility Guidelines. (See 1194.23(a)(3) in the NPRM. see below)

NPRM 1194.23(a)(3) Controls shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. The force required to activate controls shall be 5 lbs. (22.2 N) maximum. NPRM 1194.23(a)(3) provides that controls shall be accessible to persons with limited dexterity. Individuals with tremor, cerebral palsy, paralysis, arthritis, or artificial hands may have difficulty operating systems which require fine motor control, assume a steady hand, or require two hands or fingers to be used simultaneously for operation. Individuals with high spinal cord injuries, arthritis, and other conditions may have difficulty operating controls which require significant strength. The provision limits the force required to five pounds and is based on section 4.27.4 of the ADA Accessibility Guidelines

Comment. The ITIC was concerned about requiring that all controls be easily activated. They pointed out that on many pieces of equipment the on/off switch is purposely set so that it is hard to activate. This is done to prevent accidental shut-down of equipment such as with a network server.   They felt it was unreasonable to require changing that type of control.

Response. The Board has addressed this issue by adding paragraph 1194.3(f) which exempt such controls from these standards. The on/off switch on a network server for

example, would be operated only when maintenance of the equipment was required and would not be for normal operation. No changes have been made to this section in the final rule.

§ 1194.23*(k)(3) If key repeat is supported, the delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character.*

§ 1194.23(k)(3) establishes provisions for key repeat rate where an adjustable keyboard repeat rate is supported. It requires that the keyboard delay before repeat shall be adjustable to at least two seconds per character. (See 1194.23(a)(5) in the NPRM (see below).) No substantive comments were received and no changes have been made to this section in the final rule.

NPRM 1194.23(a)(5) If keyboard repeat is supported, the keyboard delay before repeat shall be adjustable to at least 2 seconds. Key repeat rate shall be adjustable to 2 seconds per character. NPRM1194.23(a)(5) establishes requirements for key repeat rate where an adjustable keyboard repeat rate is supported. It requires that the keyboard delay before repeat shall be adjustable to at least two seconds per character.

§ 1194.23(k)*(4) The status of all locking or toggle controls or keys shall be visually discernible, and discernible either through touch or sound.*

§ 1194.23(k)(4) provides that the status of toggle controls such as the "caps lock" or "scroll lock" keys be determined by both visual means and by touch or sound. For example, adding audio patterns such as ascending and descending pitch tones that indicate when a control is turned on or off would alleviate the problem of a person who is blind inadvertently pressing the locking or toggle controls. Also, buttons which remain depressed when activated or switches with distinct positions would meet this provision. (See 1194.23(a)(2) in the NPRM.(see below)) No substantive comments were received and no changes have been made to this section in the final rule.

NPRM 1194.23(a)(2)The status of all locking or toggle controls or keys shall be visually discernible, and discernible either through touch or sound. NPRM 1194.23(a)(2) provides that the status of toggle controls such as the "caps lock" or "scroll lock" keys be determined by both visual means and by touch or sound. For example, adding audio patterns such as ascending and descending pitch tones that indicate when a control is turned on or off would alleviate the problem of a person who is blind inadvertently pressing the locking or toggle controls. Also, buttons which remain depressed when activated or switches with distinct positions would meet this provision.

Subpart B — Technical Standards

§ 1194.24 Video and multimedia products.

§ 1194.24(a) All analog television displays 13 inches and larger, and computer equipment that includes analog television receiver or display circuitry, shall be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals. As soon as practicable, but not later tan July 1, 2002, widescreen digital television (DTV) displays measuring at least 7.8 inches vertically, DTV sets with conventional displays measuring at least 13 inches vertically, and stand-alone DTV tuners, whether or not they are marketed with display screens, and computer equipment that includes DTV receiver or display circuitry, shall be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals.

§ 1194.24(a) requires that television displays 13 inches and larger, and computer equipment that includes television receiver or display circuitry be equipped with the capacity to decode and display captioning for audio material. (See 1194.23(e)(1) in the NPRM. (see below))

NPRM 1194.23(e)(1) All television displays 13 inches and larger, and computer equipment that includes television receiver circuitry, shall be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals. NPRM 1194.23(e)(1) requires any system with a screen larger than 13 inches to be equipped with caption decoder circuitry which appropriately receives, decodes, and displays closed captions from broadcast, cable, videotape, and DVD signals. The FCC has standards for televisions 13 inches or larger, but video capabilities are now becoming popular in computers as well. This provision addresses these new video technologies.

§ 1194.24(b) Television tuners, including tuner cards for use in computers, shall be equipped with secondary audio program playback circuitry.

§ 1194.24(b) requires that television tuners, including tuner cards for use in computers, have the ability to handle a secondary audio track used for audio description of visual material. The secondary audio channel is commonly used for audio description. An "audio description" is a verbal description of the visual content of a presentation. Audio descriptions are important for persons with visual impairments because they provide a description of the visual content of a presentation synchronized with verbal information. (See 1194.23(e)(2) in the NPRM. see below)) No substantive comments were received and **no changes have been made to this section in the final rule.**

NPRM 1194.23(e)(2) Television tuners, including tuner cards for use in computers, shall be equipped with secondary audio program playback circuitry. NPRM 1194.23(e)(2) requires that television tuners, including tuner

cards for use in computers, be equipped with the circuitry needed to carry the secondary audio channel. The secondary audio channel is commonly used for audio description.

§ 1194.24(c) All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain speech or other audio information necessary for the comprehension of the content, shall be open or closed captioned.

§ 1194.24(c) requires the captioning of audio material in certain multimedia presentations. (See 1194.23(e)(3) in the NPRM.(see below))

NPRM 1194.23(e)(3) All video and multimedia productions, regardless of format, that contain speech or other audio necessary for the comprehension of the content, shall be open or closed captioned if the production is procured or developed for repeated showings to audiences that may include people with hearing impairments. NPRM 1194.23 (e)(3) requires that when an agency develops or procures multimedia productions that are intended to be shown repeatedly to audiences that may include persons who would need the captioning or audio description features, those productions must contain captioning or audio description. Audio description involves the insertion into a multimedia program, such as a video tape, of narrated descriptions of settings and actions that are not otherwise reflected in the dialogue, such as the movement of a person in the scene. Audio description is typically provided through the use of the Secondary Audio Programming (SAP) channel so that it is audible only when that channel is activated through a TV set, computers with a tuner card, or a VCR with SAP capability.

Under these provisions, the requirements to have a videotape or multimedia production captioned or audio described would depend on its intended use. For example, an agency produces, or contracts to have produced, a videotape on government ethics. This videotape is made available for many agencies to purchase and use in training sessions. Since the tape is intended to be shown multiple times and to varied audiences, the composition of which may include people with hearing or vision impairments, it must be captioned and audio described, unless it is an undue burden to do so. On the other hand, a small agency or single office purchases a videotape on some aspect of acoustics which it intends to show to its staff to help understand a technical issue. Since the videotape is not intended to be shown on a repeated basis, and the agency knows that none of its staff have a hearing or vision impairment, the videotape would not need to be captioned or audio described. If however, the video was to be shown to an employee who is deaf, the agency would be required to accommodate that individual by providing an interpreter even though the videotape would not be required to be captioned. Such accommodations would be required under section 501 or 504 of the Rehabilitation Act, not section 508.

The final rule has been modified to require that all training and informational video and multimedia presentations that contain speech or other audio information necessary for the comprehension of the content and which supports an agency's mission, shall be open or closed captioned regardless of the anticipated audience. This provision would not require that a videotape recorded by a field investigator to document a safety violation be captioned or audio described, for example. On the other hand, if such a videotape were subsequently used as part of a training or informational presentation, it would have to be captioned and audio described. A video of a birthday celebration would not be in support of an agency's mission and would thus not be required to be captioned. Also, this provision applies only to video and multimedia presentations which contain speech or other audio information necessary for the comprehension of the content. A video that is not narrated would not be required to be captioned since it does not contain speech.

§ 1194.24(d) All training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain visual information necessary for the comprehension of the content, shall be audio described.

§ 1194.24(d) requires that certain multimedia presentations provide an audio description of visual material. (See 1194.23(e)(4) in the NPRM. (see below))

NPRM 1194.23(e)(4) All video and multimedia productions, regardless of format, that contain visual information necessary for the comprehension of the content, shall be audio described if the production is procured or developed for repeated showings to audiences that may include people with visual impairments.

NPRM 1194.23(e)(4) requires that when an agency develops or procures multimedia productions that are intended to be shown repeatedly to audiences that may include persons who would need the captioning or audio description features, those productions must contain captioning or audio description. Audio description involves the insertion into a multimedia program, such as a video tape, of narrated descriptions of settings and actions that are not otherwise reflected in the dialogue, such as the movement of a person in the scene. Audio description is typically provided through the use of the Secondary Audio Programming (SAP) channel so that it is audible only when that channel is activated through a TV set, computers with a tuner card, or a VCR with SAP capability.

Under these provisions, the requirements to have a videotape or multimedia production captioned or audio described would depend on its intended use. For example, an agency produces, or contracts to have produced, a videotape on government ethics. This videotape is made available for many agencies to purchase and use in training sessions. Since the tape is intended to be shown multiple times and to varied audiences, the composition of which may include people with hearing or vision impairments, it must be captioned and audio described, unless it is an undue burden to do so. On the other hand, a small agency or single office purchases a videotape on some aspect of acoustics which it intends to show to its staff to help understand a technical issue. Since the videotape is not intended to be shown on a repeated basis, and the agency knows that none of its staff have a hearing or vision impairment, the videotape would not need to be captioned or audio described. If however, the video was to be shown to an employee who is deaf, the agency would be required to accommodate that individual by providing an interpreter even though the videotape would not be required to be captioned. Such accommodations would be required under section 501 or 504 of the Rehabilitation Act, not section 508.

The final rule has been modified to require that all training and informational video and multimedia productions which support the agency's mission, regardless of format, that contain visual information necessary for the comprehension of the content, shall be audio described. A video or multimedia presentation that does not be support an agency's mission would not be required to be audio described. Also, this provision applies only to videos or multimedia presentations which contain visual information necessary for the comprehension of the content. A "talking heads" video does not generally contain visual information necessary for the comprehension of the content and would therefore not be required to be audio described.

§ 1194.24(e) Display or presentation of alternate text presentation or audio descriptions shall be user-selectable unless permanent.

§ 1194.24(e) provides that the captioning and audio description required in (c) and (d) above must be user selectable unless permanent. (See 1194.23(e)(5) in the NPRM. (see below))

NPRM 1194.23(e)(5) Display or presentation of alternate text presentation or audio descriptions shall be user-selectable unless permanent. NPRM 1194.23(e)(5) provides that viewers must be able to turn captioning or video description features on or off. A person who can hear the audio may find the captioning of conversation intrusive, and people who can see the screen and can hear may find the audio description distracting. For this reason, it is important that an individual have the ability to select or deselect a particular feature.

The advisory committee also recommended that digital television receivers meet the EIA-708-A standard for the transmission of captioning on a digital television signal. The Board has not included this provision since in July 1999, the Federal Communications Commission proposed to amend its rules to include requirements for the display of closed captioned text on digital television receivers. The FCC took this action to ensure that closed captioning services are available in the transition from analog to digital broadcasting. The Board may address this issue in future changes to the standards.

Comment. The National Center for Accessible Media (NCAM) at public television station WGBH indicated that unlike captioning, audio descriptions can only be hidden and then activated on request on broadcast or cablecast video. The videotape format VHS commonly used by consumers and many companies cannot encode audio description for later activation like closed captions. Videos in the VHS format must have their descriptions permanently recorded as part of the main audio program. As a result, the audio descriptions on VHS cannot be turned off. As a solution, NCAM suggested that it may be desirable to have a separate videotape available that was not described, along with a described version to allow a user to choose which version they wish to present. Unlike the VHS format, CD_ROMs, DVDs and other multimedia can support alternate audio channels for descriptions (or alternate languages). The means of choosing those alternate tracks varies by the medium, but usually involves selection from an on_screen menu. Those menus must be made audible or otherwise readily selectable so that people who are blind or visually impaired can independently select and gain access to those audio descriptions.

Response. While the displaying of captioning is user selectable, there may be instances where the audio description would be considered permanent. The provision provides that when permanent, the user selectability provision does not apply.

Subpart B — Technical Standards

§ 1194.25 Self contained, closed products.

Paragraph 1194.25 (a) - (j) applies to those products that generally have embedded software and are commonly designed in such a fashion that a user cannot attach or install assistive technology. These products include, but are not limited to, information kiosks and information transaction machines, copiers, printers, calculators, fax machines, and other similar types of electronic office equipment. This section is a result of the reorganization of the final rule. A definition of self contained, closed products has also been added.

§ 1194.25(a) Self-contained products shall be usable by people with disabilities without requiring an end-user to attach assistive technology to the product. Personal headsets for private listening are not assistive technology.

§ 1194.25(a) provides that access features must be built-into a self contained, closed product rather than requiring users to attach an assistive device to the product. Personal headsets are not considered assistive technology and may be required to use the product. (See 1194.23(f)(1) in the NPRM. (see below))

NPRM 1194.23(f)(1) Information kiosks and transaction machines shall be usable by people with disabilities without requiring an end-user to attach assistive technology to the information kiosk or transaction machine. NPRM 1194.23(f)(1) provides that access features must be built into the system rather than requiring users to attach an assistive device to the product. Personal headsets are not considered an assistive device and may be required to use the product.

§ 1194.25(b) When a timed response is required, the user shall be alerted and given sufficient time to indicate more time is required.

§ 1194.25(b) addresses access problems that can arise when self contained, closed products require a response from a user within a certain time and is identical to §1194.22 (p) and §1194.23 (d) which are discussed in detail above. (See §1194.21(d) in the NPRM.) The final rule requires only that a user be notified if a process is about to time-out and be given an opportunity to answer a prompt asking whether additional time is needed.

§ 1194.25(c) Where a product utilizes touchscreens or contact-sensitive controls, an input method shall be provided that complies with 1194.23 (k) (1) through(4).

§ 1194.25(c) requires that when a product utilizes touchscreens or contact-sensitive controls, a method of operating the product be provided that complies with the provisions for controls in 1194.23 (k) (1) through (4). (See 1194.21(f) in the NPRM.)

§ 1194.25(d) When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, shall also be provided.

§ 1194.25(d) addresses the use of biometric controls. Biometric controls refer to controls that are activated only if particular biological features (e.g. fingerprint, retina pattern, etc.) of the user matches specific criteria. Using retinal scans or fingerprint identification may become a common practice as a method of allowing an individual to gain access to personal data from an information transaction type of machine. (See 1194.21(e) in the NPRM.)

§ 1194.25(e) When products provide auditory output, the audio signal shall be provided at a standard signal level through an industry standard connector that will allow for private listening. The product must provide the ability to interrupt, pause, and restart the audio at anytime.

§ 1194.25(e) requires that when products use audio as a way to communicate information, the auditory signal will be available through an industry standard connector at a standard signal level. Individuals using personal headphones, amplifiers, audio couplers, and other audio processing devices need a place to plug these devices into the product in a standard fashion. This gives the user the ability to listen privately to the information. The product must also provide a method to pause, restart, and interrupt the flow of information. (See 1194.23(f)(2) and 1194.25(d) in the NPRM.) No substantive comments were received on this provision and no changes were made, other than editorial changes.

§ 1194.25(f) When products deliver voice output in a public area, incremental volume control shall be provided with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20 dB above the ambient level shall be user selectable. A function shall be provided to automatically reset the volume to the default level after every use.

§ 1194.25(f) provides that when products deliver voice output, they shall provide incremental volume control with output amplification up to a level of at least 65 dB. Where the ambient noise level of the environment is above 45 dB, a volume gain of at least 20 dB above the ambient level shall be user selectable. According to the Occupational Safety and Health Administration, and the American Speech, Language, and Hearing

Association, 65 dB is the volume level for normal speech. This provision requires that audio output from a kiosk type product shall have a minimum level of 65 dB. For people with reduced hearing, voice levels must be 20 dB above the surround sound level to be understandable. This means that as long as the noise level in the surrounding environment is below 45 dB, the 65 dB output level would be sufficient. If the product is in an environment with a high noise level, the user must be able to raise the volume to a setting of 20 dB higher than the ambient level. (See 1194.23(f)(3) in the NPRM.) A feature has been required to automatically reset the volume to the default level after every use but not before. This is consistent with a similar provision addressing telecommunications products.

§ 1194.25(g) Color coding shall not be used as the only means of conveying information, indicating an action, prompting a response, or distinguishing a visual element.

§ 1194.25(g) addresses the use of color prompting and is identical to 1194.21(i) discussed above. (See 1194.21(a) in the NPRM.).

§ 1194.25(h) When a product permits a user to adjust color and contrast settings, a range of color selections capable of producing a variety of contrast levels shall be provided.

§ 1194.25(h) addresses color selection and contrast settings and is identical to 1194.21(j) discussed above. (See 1194.23(b)(8) in the NPRM.)

§ 1194.25(i) Products shall be designed to avoid causing the screen to flicker with a frequency greater than 2 Hz and lower than 55 Hz.

§ 1194.25(i) addresses the use of flashing objects and is identical to 1194.21(k) discussed above. (See 1194.21(c) in the NPRM.)

§ 1194.25(j) Products which are freestanding, non-portable, and intended to be used in one location and which have operable controls shall comply with the following:

§ 1194.25(j) (1) through (4) provide provisions for the physical characteristics of large office equipment including reach ranges and the general physical accessibility of controls and features.   Examples of these products, include but are not limited to, copiers, information kiosks and floor standing printers. This provision is based on the Americans with Disabilities Act Accessibility Guidelines (ADAAG 4.2 Space Allowance and Reach Ranges). Two figures are provided to help explain the application of the provision. (See 1194.21(b)(1) through (4) in the NPRM.)

§ 1194.25(j)(1) The position of any operable control shall be determined with respect to a vertical plane, which is 48 inches in length, centered on the operable control, and at the maximum protrusion of the product within the 48 inch length (see Figure 1 of this part).

§ 1194.25(j)(2) Where any operable control is 10 inches or less behind the reference plane, the height shall be 54 inches maximum and 15 inches minimum above the floor.

§ 1194.25(j)(3) Where any operable control is more than 10 inches and not more than 24 inches behind the reference plane, the height shall be 46 inches maximum and 15 inches minimum above the floor.

§ 1194.25(j)(4) Operable controls shall not be more than 24 inches behind the reference plane (see Figure 2 of this part).

Subpart B — Technical Standards

§ 1194.26 Desktop and portable computers.
Paragraphs (a) through (d) contain provisions that apply to desktop and portable computers. The provisions in 1194.21 for software address the accessibility of programs and operating systems that run on a computer. In contrast, the provisions in this section address physical characteristics of computer systems including the design of controls and the use of connectors.

§ 1194.26(a) All mechanically operated controls and keys shall comply with 1194.23(k)(1) through (4).

§ 1194.26(a) addresses keyboards and other mechanically operated controls. These provisions are addressed further in 1194.23 (k) (1) through (4) above. (See 1194.23(a) in the NPRM.)

§ 1194.26(b) If a product utilizes touchscreens or touch-operated controls, a redundant input method shall be provided that complies with 1194.23 (k) (1) through (4).

§ 1194.26(b) provides that systems using touchscreen technology must provide controls that comply with 1194.23 (k) (1) through (4) discussed above. (See 1194.21(f) in the NPRM.) Similar to 1194.25 (c), this provision was modified in the final rule to require redundant controls.

§ 1194.26(c) When biometric forms of user identification or control are used, an alternative form of identification or activation, which does not require the user to possess particular biological characteristics, shall also be provided.

§ 1194.26(c) requires that when biometric forms of identification are used, an alternative must also be available. This provision is identical to 1194.25 (d) discussed above.

§ 1194.26(d) Where provided, at least one of each type of expansion slots, ports and connectors shall comply with publicly available industry standards.

§ 1194.26(d) requires that products have standard ports and connectors. This means that the connection points on a system must comply with a standard specification that is available to other manufacturers. This provision assures that the designers of assistive technology will have access to information concerning the design of system connections and thus be able to produce products that can utilize those connections. (See 1194.25(b) in the NPRM.)

Subpart C — Functional Performance Criteria

§ 1194.31 Functional performance criteria.

This section provides functional performance criteria for overall product evaluation and for technologies or components for which there is no specific requirement under other sections. These criteria are also intended to ensure that the individual accessible components work together to create an accessible product. This section requires that a product's operation and information retrieval functions be operable through at least one mode addressed in each of the following paragraphs.

Comment. The ITIC requested clarification as to how a manufacturer would determine the type and number of assistive technology devices for which support must be provided by a product.

Response. Manufacturers do not need to be aware of the universe of assistive technology products on the market. Each provision specifies the type of assistive technology that must be supported. For example, 1194.31(a) addresses those assistive technology devices which provide output to persons who cannot see the screen. Such devices may include screen readers, Braille displays and speech synthesizers. There are numerous resources available to manufacturers to assist them in identifying specific types of assistive technology which would be used to access their product.

§ 1194.31(a) At least one mode of operation and information retrieval that does not require user vision shall be provided, or support for assistive technology used by people who are blind or visually impaired shall be provided.

§ 1194.31(a) provides that at least one mode of operation and information retrieval that does not require user vision shall be provided, or support for assistive technology used by people who are blind or visually impaired shall be provided. It is not expected that every software program will be self-voicing or have its own built-in screen reader. Software that complies with section 1194.21 would also satisfy this provision. (See 1194.27(a) in the NPRM.)

§ 1194.31(b) At least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 shall be provided in audio and enlarged print output working together or independently, or support for assistive technology used by people who are visually impaired shall be provided.

§ 1194.31(b) provides that at least one mode of operation and information retrieval that does not require visual acuity greater than 20/70 (when corrected with glasses) must be provided in audio and enlarged print output that works together or independently. In the alternative, support for assistive technology used by people with visual impairments must

be provided. Although visual acuity of 20/200 is considered "legally blind," there are actually millions of Americans with vision below the 20/200 threshold who can still see enough to operate and get output from technology, often with just a little additional boost in contrast or font size. This paragraph requires either the provision of screen enlargement and voice output or, that the product support assistive technology. (See 1194.27(b) in the NPRM.)

§ 1194.31(c) At least one mode of operation and information retrieval that does not require user hearing shall be provided, or support for assistive technology used by people who are deaf or hard of hearing shall be provided.

§ 1194.31(c) provides that at least one mode of operation and information retrieval that does not require user hearing must be provided, or support for assistive technology used by people who are deaf or hard of hearing shall be provided. This provision is met when a product provides visual redundancy for any audible cues or audio output. If this redundancy cannot be built-into a product then the product shall support the use of assistive technology. (See 1194.27(c) in the NPRM.)

§ 1194.31(d) Where audio information is important for the use of a product, at least one mode of operation and information retrieval shall be provided in an enhanced auditory fashion; or support for assistive hearing devices shall be provided.

§ 1194.31(d) requires that audio information important for the use of a product, must be provided in an enhanced auditory fashion by allowing for an increase in volume and/or altering the tonal quality or increasing the signal to noise ratio. For example, increasing the output would assist persons with limited hearing to receive information. Audio information that is important for the use of a product includes, but is not limited to, error tones, confirmation beeps and tones, and verbal instructions. (See 1194.27(d) in the NPRM.) The final provision has been amended editorially to provide that support for assistive hearing devices may be provided in place of built-in enhanced audio features.

§ 1194.31(e) At least one mode of operation and information retrieval that does not require user speech shall be provided, or support for assistive technology used by people with disabilities shall be provided.

§ 1194.31(e) provides that at least one mode of operation and information retrieval which does not require user speech must be provided, or support for assistive technology shall be provided. Most products do not require speech input. However, if speech input is required to operate a product, this paragraph requires that at least one alternative input mode also be provided. For example, an interactive telephone menu that requires the user to say or press "one" would meet this provision. (See 1194.27(e) in the NPRM.)

§ 1194.31(f) At least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions and that is operable with limited reach and strength shall be provided.

§ 1194.31(f) provides that at least one mode of operation and information retrieval that does not require fine motor control or simultaneous actions and which is operable with limited reach and strength must be provided. (See 1194.27(f) in the NPRM.)

Subpart D — Information, Documentation, and Support

§ 1194.41 Information, documentation, and support.

In order for a product to be fully usable by persons with disabilities, the information about the product and product support services must also be usable by persons with disabilities. These issues are addressed in this section.

§ 1194.41(a) Product support documentation provided to end-users shall be available in alternate formats upon request, at no additional charge.

§ 1194.41(a) states that when an agency provides end-user documentation to users of technology, the agency must ensure that the documentation is available upon request in alternate formats. Alternate formats are defined in section 1194.4, Definitions. Except as provided in paragraph (b) below, this provision does not require alternate formats of documentation that is not provided by the agency to other users of technology. (See 1194.31(a) in the NPRM.)

§ 1194.41(b) End-users shall have access to a description of the accessibility and compatibility features of products in alternate formats or alternate methods upon request, at no additional charge.

§ 1194.41(b) requires that agencies supply end-users with information about accessibility or compatibility features that are built-into a product, upon request. (See 1194.31(b) in the NPRM.)

§ 1194.41(c) Support services for products shall accommodate the communication needs of end-users with disabilities.

§ 1194.41(c) provides that help desks and other support services serving an agency must be capable of accommodating the communications needs of persons with disabilities. For example, an agency help desk may need to communicate through a TTY. The help desk or support service must also be familiar with such features as keyboard access and other options important to people with disabilities. (See 1194.31(a) in the NPRM.)

Figures to Part 1194